

WHAT IS CLAIMED IS:

1. A radiator fluid exchanging apparatus for servicing an engine coolant system having a radiator with an influent port and an effluent port, said apparatus comprising:

5 a first fluid supply tank for supplying a supply fluid and having a multi-directional supply coupling defining first and second supply outlets in communication with a suction inlet disposed within said first fluid supply tank;

a pressure vessel for collecting a waste fluid and including a waste fluid coupling in communication with an interior of said pressure vessel and defining a
10 waste fluid collection inlet and a waste fluid exhaust;

a pressure generator coupled to said pressure vessel and being operable to selectively direct said waste fluid into said pressure vessel through said waste fluid collection inlet under a negative pressure;

a remove and fill control manifold coupled to said pressure vessel and
15 said first fluid supply tank and including a remove and replacement port for coupling to said effluent radiator port, said remove and fill control manifold including a waste fluid collection pathway for routing said waste fluid entering said remove and fill control manifold from said effluent radiator port, when coupled thereto, to said waste fluid collection inlet, and further defining a fluid replacement pathway for routing said
20 supply fluid entering said remove and fill control manifold from one of said supply outlets of said first fluid supply tank to said effluent port of said radiator, when coupled thereto, said remove and fill control manifold being selectively operable to direct said

waste fluid through said waste fluid collection pathway or said supply fluid through said fluid replacement pathway under said negative pressure;

a flush control manifold coupled to said first fluid supply tank and said pressure vessel, said flush control manifold including a fluid supply pathway between
5 one of said supply outlets and a pump exhaust outlet and further defining a drain pathway for routing said collected waste fluid exiting said waste fluid exhaust to said pump exhaust outlet, said flush control manifold being selectively operable to route said supply fluid through said fluid supply pathway or said collected waste fluid through said drain pathway; and

10 a pump including a fluid receiving inlet coupled to said pump exhaust outlet of said flush control manifold and further including a fluid directing outlet for coupling to said influent port of said radiator, said pump being selectively operable to direct said supply fluid from said first fluid supply tank into said fluid receiving inlet and out of said fluid directing outlet when said flush control manifold is selectively
15 positioned to open said fluid supply pathway.

2. The radiator fluid exchanging apparatus as set forth in claim 1 further including:

a fluid removal and replacement conduit including a first end coupled to
20 said remove and replacement port and a free end for coupling to said effluent port of said radiator.

3. The radiator fluid exchanging apparatus as set forth in claim 1 further including:

a fluid supply conduit including a first end coupled to said fluid directing outlet of said pump and a free end for coupling to said influent port of said radiator.

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4. The radiator fluid exchanging apparatus as set forth in claim 2 further including:

a fluid supply conduit including a first end coupled to said fluid directing outlet of said pump and a free end for coupling to said influent port of said radiator.

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5. The radiator fluid exchanging apparatus as set forth in claim 1 further including:

an auxiliary fluid supply tank for supplying an alternative fluid to said radiator and having a multi-directional coupling with first and second auxiliary fluid supply outlets in communication with an auxiliary suction tube inlet disposed within said auxiliary fluid supply tank, at least one of said auxiliary fluid supply outlets being in communication with at least one of said manifolds.

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6. The radiator fluid exchanging apparatus as set forth in claim 5 wherein:
one of said auxiliary fluid supply outlets is in communication with said flush control manifold; and

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said flush control manifold includes an auxiliary fluid supply pathway for selectively placing said auxiliary fluid supply tank in communication with said fluid receiving inlet of said pump.

5 7. The radiator fluid exchanging apparatus as set forth in claim 5 further including:

a wheeled cabinet enclosing said primary and auxiliary fluid supply tanks, said pressure vessel, said pump, and said manifolds.

10 8. The radiator fluid exchanging apparatus as set forth in claim 1 further including:

a low level fluid sensor in said primary fluid supply tank proximate a bottom surface of said primary fluid supply tank for generating a low supply fluid level signal;

15 an upper fluid level sensor in said pressure vessel proximate an upper surface of said pressure vessel for generating a high waste fluid level signal;

a lower fluid level sensor in said pressure vessel proximate a bottom surface of said pressure vessel for generating a low waste fluid level signal; and

20 a main board in electrical communication with each of said sensors and programmed to generate a status indicator corresponding to said fluid level signal received from at least one of said sensors.

9. The radiator fluid exchanging apparatus as set forth in claim 8 further including:

an auxiliary fluid supply tank for supplying an alternative fluid to said radiator and having a multi-directional coupling with first and second auxiliary fluid supply outlets in communication with an auxiliary suction tube inlet disposed within said auxiliary fluid supply tank, at least one of said auxiliary fluid supply outlets being in communication with said flush control manifold; and

a low level auxiliary fluid sensor in said auxiliary fluid supply tank proximate a bottom of said auxiliary tank for generating a low auxiliary fluid level signal, said lower auxiliary low level fluid sensor being in electrical communication with said main board.

10. The radiator fluid exchanging apparatus as set forth in claim 8 further including:

a delay circuit in electrical communication with said upper fluid level sensor in said pressure vessel and said main board, said main board being responsive to shut off said pressure generator upon receiving a signal from said delay circuit after a predetermined time period.

11. The radiator fluid exchanging apparatus as set forth in claim 10 wherein:
said delay circuit includes an adjustable capacitor element for adjusting said predetermined time period.

12. The radiator fluid exchanging apparatus as set forth in claim 11 wherein:
said capacitor element is responsive to the turning of a set screw in
communication therewith to adjust said predetermined time period.

5 13. The radiator fluid exchanging apparatus as set forth in claim 4 wherein:
said free ends of said fluid removal and replacement conduit and said
fluid supply conduit include a quick disconnect and a ball valve for opening and
closing the fluid passage therethrough.

10 14. The radiator fluid exchanging apparatus as set forth in claim 2 wherein:
said free end of said fluid removal and replacement conduit is coupled to
a cone adapter having a seal with a throughbore for inserting into a fill neck of said
radiator.

15 15. The radiator fluid exchanging apparatus as set forth in claim 3 wherein:
said free end of said fluid supply conduit is coupled to an open ended
wand adapter for supplying fluid to the influent port of said radiator.

16. The radiator fluid exchanging apparatus as set forth in claim 2 wherein:
20 said free end of said fluid removal and replacement conduit is coupled to
an open ended wand adapter for suctioning off fluid from said radiator.

17. The radiator fluid exchanging apparatus as set forth in claim 4 further including:

an elongated auxiliary adapter including a first end with first adapter port coupled to the free end of said removal and replacement conduit and a second adapter port coupled to the free end of the fluid supply conduit said adapter, the second end of said auxiliary adapter including corresponding first and second exhaust ports, said auxiliary adapter further including at least one selectively operable valve for routing a fluid from exiting said adapter ports to said corresponding exhaust ports, or routing fluid exiting one adapter port into the other said adapter port, or routing fluid exiting one adapter port to the exhaust port corresponding to the other of said adapter ports.

18. The radiator fluid exchanging apparatus as set forth in claim 1 wherein: said control manifolds are ball valves constructed to selectively route fluid between at least two fluid pathways.

19. The radiator fluid exchanging apparatus as set forth in claim 1 further including:

a pressure gauge in fluid communication with said remove and fill control manifold for sensing fluid pressure issuing from said remove and replacement port.

20. The radiator fluid exchanging apparatus as set forth in claim 10 wherein:
said predetermined time period is from approximately 7-11 seconds.

21. The radiator fluid exchanging apparatus as set forth in claim 5 wherein:

5 one of said auxiliary fluid supply outlets is in communication with said
remove and fill control manifold; and

said remove and fill control manifold defines a third fluid pathway for
selectively placing said auxiliary fluid supply tank in communication with said remove
and replacement port.

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22. A radiator fluid exchanging apparatus for servicing an engine coolant
system in the form of a cooling loop with an influent port and an effluent port, said
apparatus comprising:

15 a primary supply tank having a first supply outlet and a second supply
outlet;

a waste fluid collection tank defining a pressure chamber and having a
waste fluid collection inlet;

a pressure generator in communication with said pressure chamber and
being selectively operable to draw fluid into said chamber under negative pressure;

20 a remove and replace control manifold for coupling to said effluent port
and including a waste fluid collection pathway for routing waste fluid from said
effluent port, when coupled thereto, to said waste fluid collection inlet, and further

defining a fluid replacement pathway for routing a supply fluid from one of said supply outlets to said effluent port under negative pressure;

a pump including a pump inlet and an outlet for coupling to said influent port and selectively operable to transfer fluid entering said pump to said influent port

5 when coupled thereto; and

a flush control manifold coupled to said pump inlet and including a fluid supply pathway for routing said supply fluid from the other of said supply outlets of said primary supply tank to said pump inlet, said flush control manifold being

selectively operable to route said supply fluid through said fluid supply pathway to

10 said pump inlet.

23. The radiator fluid exchanging apparatus as set forth in claim 22 wherein:

said waste fluid collection tank includes a waste fluid exhaust;

said flush control manifold further includes a drain pathway in

15 communication with said waste fluid exhaust and said flush control manifold is selectively operable to open said pathway; and

said pump being selectively operable to route said waste fluid through said drain pathway to said pump outlet.

20 24. A radiator fluid exchanging apparatus for servicing an engine coolant system including effluent and influent ports, said apparatus comprising:

at least one fluid supply tank for containing a volume of supply fluid and including a fluid supply coupling defining a first supply outlet and a second supply outlet in communication with an inlet disposed within said supply tank;

5 a waste fluid collection tank defining a pressure chamber and including a waste fluid collection inlet and a waste fluid exhaust;

air pressure generating means in communication with said pressure chamber, said pressure generating means being selectively operable to draw fluid into said chamber under negative pressure through said waste fluid collection inlet;

10 pump means couplable to said influent port for transporting fluid thereto; and

fluid routing means including a first valving component couplable to said effluent port and interposed between said waste fluid collection inlet and one of said supply outlets and a second valving component in communication with said other of said supply outlets and said pump to supply fluid thereto, said routing means being
15 selectively operable to route a supply fluid from said supply tank to said pump for transference to said influent port or route a waste fluid from said effluent port to said waste fluid collection tank and resupply a like amount of supply fluid from said supply tank to said effluent port under negative pressure generated by said air pressure generating means.

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25. A method of exchanging fluid with a radiator including a fill neck using only vacuum pressure, said method comprising:

providing a radiator fluid exchanging apparatus including a fluid supply tank with a fluid supply and a supply outlet and a pressure vessel with a pressure generator for generating negative pressure in said vessel and a waste collection inlet, said apparatus further including a selectively positionable fluid control manifold in communication with said supply outlet and said waste collection inlet and including a remove and fill port;

supplying a remove and fill conduit;

coupling one end of said remove and fill conduit to said remove and fill port;

coupling a free end of said remove and fill conduit to an adapter having a seal with a throughbore;

coupling said seal with said fill neck of said reservoir;

selectively positioning said fluid control manifold to place said pressure vessel in communication with said radiator via said remove and fill conduit;

actuating said pressure generator to draw fluid from said radiator into said pressure vessel to generate a negative pressure in said radiator; and

selectively positioning said fluid control manifold to place said primary fluid supply tank in communication with said radiator via said remove and fill conduit whereby said supply fluid from said supply tank may be drawn into said radiator under negative pressure in said radiator.

26. A method of testing the pressure in an engine cooling system having a radiator with a radiator cap on a fill neck and an influent port, said method comprising:

providing a radiator fluid exchanging apparatus including at least one fluid supply tank with a fluid supply and with a first supply outlet and a second supply outlet, said apparatus further including a first fluid control manifold in communication with one of said supply outlets and a pump couplable to said influent port and defining a fluid supply pathway therebetween, said apparatus further including a second selectively positionable fluid control manifold defining a fluid pressure feedback pathway between the other of said supply outlets and a pressure gauge, said fluid control manifold being selectively operable to open and close said respective fluid pathways;

coupling one end of a servicing conduit to said pump and an opposing end to said influent port, said conduit including a selectively openable flow control valve;

securing said radiator cap to said fill neck;
selectively opening said fluid supply pathway;
selectively opening said fluid pressure feedback pathway;
actuating said pump to transfer fluid from said supply tank to said influent port;

opening said flow control valve; and
viewing said pressure reading on said pressure gauge until a predetermined pressure threshold is met.

27. A radiator fluid exchanging apparatus for servicing an engine coolant system including effluent and influent ports, said apparatus comprising:

at least one fluid supply tank for containing a volume of supply fluid and including a fluid supply coupling defining a first supply outlet and a second supply

5 outlet in communication with an inlet disposed within said supply tank;

a waste fluid collection tank defining a pressure chamber and including a waste fluid collection inlet and a waste fluid exhaust;

air pressure generating means in communication with said pressure chamber, said pressure generating means being selectively operable to draw fluid into
10 said chamber under negative pressure through said waste fluid collection inlet;

pump means couplable to said influent port for transporting fluid thereto;

and

means for routing fluid from one of said ports of said engine cooling system to said waste fluid collection tank and routing fluid to said one of said ports
15 from said fluid supply tank under negative pressure generated by said air pressure operating means.